CLAIMS

1. An apparatus for increasing the proportion of a responsive signal relative to environmental noise in a system for measuring electromagnetic activity generated by one or more sources inside a living body, comprising:

a plurality of spaced apart body sensors distributed outside the body proximate the one or more sources for sensing the electromagnetic activity, said body sensors being primarily responsive to magnetic fields and producing respective body sensor outputs;

a plurality of spaced apart first reference sensors distributed outside the body corresponding to said body sensors for sensing the environmental noise, said first reference sensors being primarily responsive to electric fields and producing respective first reference sensor outputs;

a shield disposed between said body and said first reference sensors for shielding said first reference sensors from the electromagnetic activity; and

an analyzing module for determining portions of said body sensor outputs that covary with corresponding portions of said first reference sensor outputs and subtracting said portions of said body sensor outputs from the respective said body sensor

outputs.

2. The apparatus of claim 1, wherein said body sensors include SQUIDs, further comprising a chamber adapted to contain said SQUIDs immersed in a super-cooling fluid.

3. The apparatus of claim 2, wherein said chamber is adapted to maintain said shield at a super-conducting temperature at the temperature of said fluid.

4. The apparatus of claim 3, wherein said first reference sensors include coils.

5. The apparatus of claim 2, wherein said first reference sensors include coils.

6. The apparatus of claim 1, wherein said first reference sensors include coils.

7. The apparatus of claim 1, further comprising a plurality of spaced apart second reference sensors distributed outside the body, corresponding to said body sensors, for sensing the environmental noise, said second reference sensors being primarily responsive to magnetic fields and producing respective first reference sensor

outputs, wherein said shield shields said second reference sensors from the electromagnetic activity.

8. The apparatus of claim 7, wherein said body sensors and said second reference sensors include SQUIDs, further comprising respective chambers each adapted to contain the respective said SQUIDs immersed in a super-cooling fluid.

9. The apparatus of claim 8, wherein said chamber is adapted to maintain said shield at a super-conducting temperature at the temperature of said fluid.

10. The apparatus of claim 9, wherein said first reference sensors include coiled wire.

11. The apparatus of claim 8, wherein said first reference sensors include coiled wire.

12. The apparatus of claim 7, wherein said first reference sensors include coiled wire.

13. An apparatus for increasing the proportion of a responsive signal relative to environmental noise in a system for measuring electromagnetic activity generated by one or more sources inside a living body, comprising:

a plurality of spaced apart body sensing electrodes for surface contact with the body proximate the one or more sources for sensing the electromagnetic activity, said electrodes being primarily responsive to current flows on the surface of the body and producing respective electrode outputs;

a plurality of spaced apart reference sensors distributed outside the body corresponding to said electrodes for sensing the environmental noise, said reference sensors being primarily responsive to magnetic fields and producing respective reference sensor outputs;

a shield disposed between said electrodes and said reference sensors for shielding said reference sensors from the electromagnetic activity; and

an analyzing module for determining portions of said electrode outputs that covary with corresponding portions of said reference sensor outputs and subtracting said portions of said electrode outputs from the respective said body sensor outputs.

14. The apparatus of claim 6, wherein said reference sensors include SQUIDs, further comprising a chamber adapted to contain said SQUIDs immersed in a super-cooling fluid.

15. The apparatus of claim 14, wherein said chamber is adapted to maintain

said shield at a super-conducting temperature at the temperature of said fluid.

16. The apparatus of claim 15, further comprising a sensor net adapted to connect each of said electrodes to at least two others of said electrodes by means of respective flexible members.

17. The apparatus of claim 16, wherein said sensor net is adapted to fix the relative positions of said electrodes, where each of said flexible members is under the same amount of tension, in a geodesic pattern.

18. The apparatus of claim 14, further comprising a sensor net adapted to connect each of said electrodes to at least two others of said electrodes by means of respective flexible members, wherein said sensor net is adapted to fix the relative positions of said electrodes, where each of said flexible members is under the same amount of tension, in a geodesic pattern.

19. The apparatus of claim 13, further comprising a sensor net adapted to connect each of said electrodes to at least two others of said electrodes by means of respective flexible members, wherein said sensor net is adapted to fix the relative positions of said electrodes, where each of said flexible members is under the same amount of tension, in a geodesic pattern.

20. An apparatus for increasing the proportion of a responsive signal relative to environmental noise in a system for measuring electromagnetic activity generated by one or more sources inside a living body, comprising:

a plurality of spaced apart body sensing electrodes for surface contact with the body proximate the one or more sources for sensing the electromagnetic activity, said electrodes being primarily responsive to current flows on the surface of the body and producing respective electrode outputs;

a plurality of spaced apart reference sensors distributed outside the body corresponding to said electrodes for sensing the environmental noise, said reference sensors being primarily responsive to electric fields and producing respective reference sensor outputs; and

an analyzing module for determining portions of said body sensor outputs that covary with corresponding portions of said reference sensor outputs and subtracting said portions of said body sensor outputs from the respective said body sensor outputs.

21. The apparatus of claim 20, further comprising a sensor net adapted to connect each of said electrodes to at least two others of said electrodes by means of

respective flexible members.

22. The apparatus of claim 21, wherein said sensor net is adapted to fix the relative positions of said electrodes, where each of said flexible members is under the same amount of tension, in a geodesic pattern.

23. A method for increasing the proportion of a responsive signal relative to environmental noise in a system for measuring electromagnetic activity generated by one or more sources inside a living body, comprising:

distributing a plurality of spaced apart body sensors outside the body proximate the one or more sources, said body sensors being primarily responsive to magnetic fields;

sensing the electromagnetic activity with said body sensors and producing respective body sensor outputs representative thereof;

distributing a plurality of spaced apart first reference sensors outside the body corresponding to said body sensors, said first reference sensors being primarily responsive to electric fields;

sensing the environmental noise with said reference sensors and producing

respective first reference sensor outputs representative thereof;

shielding said first reference sensors from the electromagnetic activity;

determining portions of said body sensor outputs that covary with corresponding portions of said first reference sensor outputs; and

subtracting said portions of said body sensor outputs from the respective said body sensor outputs.

24. The method of claim 23, wherein said body sensors include SQUIDs.

25. The method of claim 24, wherein said shield is super-conducting.

26. The method of claim 23, wherein said shield is superconducting.

27. The method of claim 23, further comprising distributing a plurality of spaced apart second reference sensors outside the body corresponding to said body sensors, said second reference sensors being primarily responsive to magnetic fields, shielding said second reference sensors from the electromagnetic activity, sensing the environmental noise and producing respective first reference sensor outputs representative thereof.

28. The method of claim 27, wherein said body sensors and said second reference sensors include SQUIDs.

29. The method of claim 28, wherein said step of shielding includes providing a super-conducting shield.

30. The method of claim 27, wherein said step of shielding includes providing a super-conducting shield.

31. A method for increasing the proportion of a responsive signal relative to environmental noise in a system for measuring electromagnetic activity generated by one or more sources inside a living body, comprising:

distributing a plurality of spaced apart body sensing electrodes for surface contact with the body proximate the one or more sources, said electrodes being primarily responsive to current flows on the surface of the body;

sensing the electromagnetic activity with said electrodes and producing respective electrode outputs representative thereof;

distributing a plurality of spaced apart reference sensors distributed outside

the body corresponding to said electrodes, said reference sensors being primarily responsive to magnetic fields;

sensing the environmental noise and producing respective reference sensor outputs representative thereof;

shielding said reference sensors from the electromagnetic activity;

determining portions of said electrode outputs that covary with corresponding portions of said reference sensor outputs; and

subtracting said portions of said electrode outputs from the respective said body sensor outputs.

32. The method of claim 31, wherein said reference sensors include SQUIDs.

33. The method of claim 32, wherein said step of shielding includes providing a super-conducting shield.

34. The method of claim 31, wherein said step of shielding includes providing a super-conducting shield.

35. The method of claim 34, further comprising connecting each of said electrodes to at least two others of said electrodes by means of respective flexible members.

36. The method of claim 35, further comprising fixing the relative positions of said electrodes, where each of said flexible members is under the same amount of tension, in a geodesic pattern.

37. The method of claim 33, further comprising connecting each of said electrodes to at least two others of said electrodes by means of respective flexible members, and fixing the relative positions of said electrodes, where each of said flexible members is under the same amount of tension, in a geodesic pattern.

38. The method of claim 32, further comprising connecting each of said electrodes to at least two others of said electrodes by means of respective flexible members, and fixing the relative positions of said electrodes, where each of said flexible members is under the same amount of tension, in a geodesic pattern.

39. The method of claim 31, further comprising connecting each of said electrodes to at least two others of said electrodes by means of respective flexible members, and fixing the relative positions of said electrodes, where each of said flexible members is under the same amount of tension, in a geodesic pattern.

40. A method for increasing the proportion of a responsive signal relative to environmental noise in a system for measuring electromagnetic activity generated by one or more sources inside a living body, comprising:

distributing a plurality of spaced apart body sensing electrodes for surface contact with the body proximate the one or more sources, said electrodes being primarily responsive to current flows on the surface of the body;

sensing the electromagnetic activity with said body sensing electrodes and producing respective electrode outputs representative thereof;

a plurality of spaced apart reference sensors distributed outside the body corresponding to said electrodes for sensing the environmental noise, said reference sensors being primarily responsive to electric fields and producing respective reference sensor outputs;

sensing the environmental noise with said reference sensors and producing respective electrode outputs representative thereof;

determining portions of said electrode outputs that covary with

corresponding portions of said reference sensor outputs; and

subtracting said portions of said electrode outputs from the respective said body sensor outputs.

41. The method of claim 40, further comprising connecting each of said electrodes to at least two others of said electrodes by means of respective flexible members.

42. The method of claim 41, further comprising fixing the relative positions of said electrodes, where each of said flexible members is under the same amount of tension, in a geodesic pattern.